FORAGE GRASSES AND LEGUMES WITH BROAD ADAPTATION FOR SOUTHEAST ASIA

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ABSTRACT
A wide range of forages is currently being evaluated by farmers and researchers in seven countries in Southeast Asia. Broadly-adapted species have been identified for fodder banks, grazed systems, tree cropping, erosion control and improved fallows. The most promising accessions to date are *Stylosanthes guianensis* CIAT 184, *Brachiaria decumbens* cv Basilisk, *Brachiaria humidicola* cv Tully and CIAT 6133, CIAT 6780, *Centrosema pubescens* CIAT 15160 and *Andropogon gayanus* cv Kent and CIAT 621. Other forages that show promise are *Paspalum atratum, Arachis pintoi,* and *Macroptilium gracile* cv. Maldonado. Local seed supply and distribution systems are needed to ensure that these species reach their potential on farms.

KEYWORDS
Forages tropical legumes, tropical grasses, adaptation, Southeast Asia

INTRODUCTION
Livestock are an integral part of smallholder cropping systems in Southeast Asia. As cropping areas have expanded, feed resources for livestock have become scarce. Planted forages are one potential way to ease this pressure. However, smallholder farming systems in Southeast Asia have one feature in common: great diversity and complexity. Adjacent communities can frequently have completely different physical, social and economic constraints and opportunities within their farming systems. n many upland areas of Southeast Asia, not only do the physical conditions and farming practices in a community change dramatically as you move from the valley floor to the hilltops, but the ethnic groups within each major part of that transition may also be different. As a direct result of this diversity, adoption of forage technologies is commonly patchy at best, especially when those technologies are developed in one location (such as a research station) and extended to others.

Two steps that can be taken to improve development strategies across such diversity:

1. develop forage technologies, using farmer participatory research methods, that are robust to changes in the conditions that affect their performance and
2. provide a range of these technologies to local communities so they can select those most appropriate to them.

A network of researchers from seven countries in Southeast Asia is using this approach in regional forage evaluations to identify and develop forage species that are broadly-adapted to the soil and climatic conditions of the region (Gabunada et al., 1997). This paper summarizes the findings and highlights the most promising species, based on these new evaluations and previous experience (Stür *et al.,* 1995).

RESULTS AND DISCUSSION
The main existing or potential systems of utilization of forages across the region are (Horne *et al.*, 1996):

Fodder banks - forages planted in hedgerows, fencelines or intensively-managed plots around villages which are cut and fed to animals directly, or used for making conserved feed (such as leaf meal);

Forages for grazed systems - both in communally grazed grasslands and more-intensively managed commercial pastures;

Forages integrated with tree crops - especially in coconut plantations and emerging agroforestry applications;

Erosion control - especially as cover crops and contour rows in upland cropping systems;

Improved fallows - especially in shifting cultivation systems, which are now subject to reductions in fallow times and subsequent loss of soil fertility.

Table 1 summarizes the species that have already been characterized in each country as either (1) broadly adapted or (2) still being evaluated but showing promise of being broadly adapted. Some of the species are more robust and broadly adapted to soils and climate than others. *Desmanthus virgatus*, for example, is better adapted to alkaline soils and currently listed as broadly-adapted in Thailand and (possibly) Philippines. Large quantities of seed of Brachiaria ruziziensis have been produced in Thailand (Phaikaew *et al.,* 1997) but it is best adapted to fertile soils in high rainfall areas. *Panicum maximum* and *Pennisetum purpureum* are common in all seven countries but are limited to the more-fertile soils in wetter lowland areas and largely for cut-and-carry feeding systems (both small and commercial scale).

Despite regional differences, several forages stand out as having both broad adaptation and multiple uses in many countries:

Stylosanthes guianensis (CIAT 184) - grows well in all soil types and climatic conditions but is particularly suited to acid soils in the hot, humid tropics. It shows promise as a species for undersowing upland rice and improving fallows; for cut feed and leaf meal production; for contour hedgerows and for grazed mixtures with grasses.

Brachiaria decumbens (cv Basilisk) - grows well in a wide range of soil types and climates but is best suited to well-drained soils in the hot, humid tropics. It is particularly suited to fodder banks (which have potential in most upland cropping systems) and grazed situations, and is persistent under adverse conditions.

Brachiaria brizantha (CIAT 6780) - has similar adaptation to *B. decumbens* cv Basilisk but is taller, usually has a higher dry matter yield and is particularly suited to fodder banks and contour rows.

Brachiaria humidicola (cv Tully and CIAT 6133) - adapted to a wide range of soil pH and fertility but is best suited to the wetter areas of the humid tropics. Once established, it has excellent persistence under very heavy grazing and potential for erosion control (but not as contour rows in upland systems because of spreading habit).

Centrosema pubescens (CIAT 15160) - adapted to more-fertile soils (pH>5) in the wetter areas of the humid tropics. It has particular potential in upland cropping systems for erosion control, fallow improvement and as a fodder bank.

Andropogon gayanus (cv Kent and CIAT 621) - is well adapted to a wide range of soil and climatic conditions but is particularly suited to locations with long dry conditions and/or infertile soils where other adapted species are not available. Can be used for both grazing and fodder banks.

Other promising species include *Paspalum atratum* (in fodder banks, especially in wetter soils), *Arachis pintoi* (very persistent for erosion control and grazed pastures) and *Macroptilium gracile* cv Maldonado (well adapted to poor soils in the humid tropics; potential use in fallow improvement after upland rice).

These broadly adapted species are currently being tried and evaluated by farmers at more than 20 locations in Southeast Asia to identify the few that are best adapted to the environment and opportunities at each location. The challenge is now to develop local supply and distribution systems of planting material so that these species can achieve their potential on farms (Phaikaew *et al.,* 1977).

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Table 1
Broadly-adapted and promising forage species for seven countries in Southeast Asia[1]

	Fodder banks (cut and carry)	Forages for Grazing Systems	Forages integrated with tree crops	Erosion Control	Improved fallows
1. BROADLY ADAPTED FORAGES					
Grasses					
Andropogon gayanus cv Kent & CIAT621	I.L	I,L			
Brachiaria brizantha CIAT 6780	I	I	I	I	
Brachiaria decumbens cv Basilisk	M,P,I,L	M,P,I,L	P,I	L,C	
Brachiaria humidicola cv Tully		M,P,I,L			
Brachiaria mutica	V	V			
Brachiaria ruziziensis	T	T			
Panicum maximum (various)	M,T,P,L,C,V	M,T,P,L	V		
Pennisetum purpureum (and hybrids)			I		
Stenotaphrum secundatum		P,I	P,I	P,I	P,I
Herbaceous Legumes					
Centrosema pubescens CIAT 15160	P,I	P,I		P,I	P,I
Macroptlium atropurpureum		V			P.V
Stylosanthes guianensis CIAT 184	M,P,I,C	M,P,I		P,I	P,I
Stylosanthes hamata cv Verano			T,L		
Shrubs					
Desmanthus virgatus (various)	T				
Gliricidia sepium	P,I				
Leucaena leucocephala		P,I,V			
2. MAY BE BROADLY ADAPTED					
Grasses					
Andropogon gayanus cv Kent	P,V	P,V			
Brachiaria brizantha CIAT 6780	P,L,V	P,L,V	P,L,V	C	
Brachiaria decumbens cv Basilisk				C	
Panicum maximum CIAT 6299	V				
Paspalum atratum BRA9610	M,T,I,L,V				
Pennisetum purpureum cv Mott	M				
Urochloa mozambicensis	I	I			
Herbaceous Legumes					
Aeschynomene americana cv Glenn	V	V			
Arachis pintoi (various)		M,T,P	M,T,P,C		
Chamaecrista rotundifolia cv Wynn		V		V	V
Macroptilium gracile cv Maldonado				T,I,L,V	T,I,L,V
Stylosanthes guianensis CIAT 184	T,L,V	T,L,V		T,I,L,V	T,I,L,V
Stylosanthes hamata cv Verano		I,V			
Shrubs					
Desmodium rensonii	P				
Desmanthus virgatus (various)	L,V,P			I	I
Gliricidia sepium	M,L,V,I				
Leucaena leucocephala		M			

[1] C=Hainan Province = China; I=Indonesia; L=Lao PDR; M=Malaysia P=Philippines; T=Thailand; V=Vietnam